DOCUMENT RESUME

ED 049 143 SO 000 995

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TITLE	Inquiry Dialogue in the Classroom.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO	BR-6-1678
PUB DATE	71
CONTRACT	OEC-3-7-061678-2942
NOTE	37p.; Paper presented at the Annual Convention, American Educational Research Association, New York, New York, February, 1971
EDRS PRICE	EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS	*Classroom Communication, Classroom Observation Techniques, Classroom Research, Cognitive Processes, *Discussion (Teaching Technique), *Inquiry Training, *Interaction Process Analysis, Models, Questioning Techniques, Secondary Grades, Social Problems, *Social Studies, Student Behavior, Teacher Behavior, Teaching Styles, Verbal Communication
IDENTIFIERS	*Michigan Social Issues Cognitive Category System, Michigan Social Issues Project

ABSTRACT

This study investigated the relationship between teacher behavior and pupil reflective dialogue in the classroom assuming that social problems provide a natural springboard for inquiry through classroom discussion. It was hypothesized that different teacher strategies promote different types of class interaction. Discussion styles were to be categorized as expository, inquiry-nonprobing, and inquiry-probing according to the essential components of reflective thinking: 1) recognizing a problem; 2) presenting hypotheses, and, 3) probing hypotheses by testing their defensibility. In addition, it was anticipated that the two types of inquiry classes would differ in terms of the cognitive interaction. Sixteen social studies classes in fifteen different Michigan secondary schools comprised the sample. The intent was to audio-tape normal classroom practice with verbal behavior coded using the Michigan Social Issues Cognitive Category System focusing on hypothesizing, defining, clarifying, and evidencing. An I/D ratio similar to Flanders' measured whether teachers attempted to influence the discussion directly or indirectly (inquiry). It was found that: 1) the level of student participation was greater in the inquiry classes; 2) teachers tend to ask more questions and use student ideas more in inquiry classes; and, 3) the main aspect of teacher influence was the type of questions asked. ED 039 161 and ED 039 162 are other project reports. (SBE)

ED049143

INQUIRY DIALOGUE IN THE CLASSROOM

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Paper presented at the 1971 meeting of the American Educational Research Association

SO 000 995

This study, based on the view that fostering reflective examination of social issues is a valued educational goal, investigated the relationship between teachers' behavior and pupils' reflective dialogue in the classroom.[1] It was assumed that social problems provide a natural springboard for inquiry, but whether or not these issues are dealt with reflectively depends on the interaction of the classroom participants.

The essential components of reflective thinking were defined as (1) recognizing a problem, (2) presenting hypotheses, and (3) probing hypotheses by testing their "defensibility." Classroom discussions which emphasize all of the above aspects of reflective thought were defined as inquiry-probing. Classroom discussions which emphasize the first two components, recognizing a problem and generating hypotheses, but not the third, probing hypotheses, were considered inquiry-nonprobing. In classes where the discussion consists primarily of exposition and hypotheses are infrequently generated or probed, the discussion was characterized as expository.

It was hypothesized that different teacher strategies promote different types of class interaction. For example, teachers encourage inquiry discussions as opposed to expository discussions by (1) using indirect influence, and (2) asking questions which call for hypotheses, definition, clarification, and grounding. It was anticipated that students in the inquiry classes would spend more time participating in the discussion than students in the expository classes. Also, it was hypothesized that inquiry-probing and inquiry-nonprobing discussions would differ in terms of the cognitive interaction following student hypotheses. In inquiry-nonprobing classes it was

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[1]This study was part of an intensive examination of the teaching of social issues in Michigan secondary classrooms carried out by the staff of the project, Structure and Process of Inquiry Into Social Issues in Secondary Schools. Byron G Massialas was director; Nancy Freitag Sprague and Jo Ann Cutler Sweeney were the associate directors.

expected that after a student hypothesis, the teacher or students would frequently give or request additional hypotheses and positions, while in inquiry-probing classes, it was expected that the students would naturally defend their hypotheses or that the teacher would request that they do so.

SAMPLE

Sixteen social studies classes in fifteen different Michigan secondary schools comprised the sample. The teachers or these social studies classes were unique in that they said that social issues instruction was important and expressed attitudes which supported the reflective examination of these issues in the classroom. The classes in the sample regularly devoted at least 25 percent of their time to the discussion of social issues.

Since the intent of the study was to examine social issues discussions which exist in normal practice in the classroom, the teachers and classes were encouraged not to change their course or study or class routine when we visited the class for taping. Each class was taped twice. Special topics were not selected by the research staff; instead the teacher outlined what controversial topics were coming up for discussion and with the staff selected a day for recording the discussions.

CODING THE CLASSROOM INTERACTION

The verbal behavior occurring during the classroom discussions of social issues was coded using the Michigan Social Issues Cognitive Category System. The category system focuses on cognitive operations such as hypothesizing, defining, clarifying, and evidencing which are important in the reflective examination of social issues. The instrument permits one to classify spontaneous social issues classroom discourse and to analyze the sequence and distribution of patterns of interaction between members of a class. As with

almost all other cognitive category systems which are fairly complex, the Michigan System is designed for use with transcripts of classroom dialogue.

Table 1 presents a summary of the categories and subcategories in the Michigan System. The system consists of nine basic categories, eight are cognitive (categories 1-4 and 6-9) and one is identified as non-cognitive (category 5). Categories 5 through 9 are further subdivided into more specific categories to make a total of 26. All 26 categories are defined in terms of the classroom speaker; no single category is restricted to teacher statements or student statements.

Categories 1-4 are "request" categories. In these categories the speaker requests that another speaker perform a particular cognitive operation. The operations in category 5 are non-cognitive since they do not involve explicit contributions to the cognitive discourse. Categories 6-9 are cognitive categories paralleling categories 1-4. Whereas in categories 1-4 the speaker is _requesting_ that a cognitive operation be performed, it categories 6-9 the speaker is actually _performing_ a given cognitive operation.[2]

The unit of measurement in the Michigan System is an intellectual operation. An intellectual operation is defined as a remark or series of remarks expressing a single operation as defined by the categories, regardless of time spent.

The audio tapes of the classroom dialogue were first transcribed, and then six coders working in pairs used the Michigan Social Issues Cognitive Category System to code the 16 transcripts. The coders were randomly divided

[2]In addition to a more detailed explanation of the categories, Appendix A includes examples and guidelines for coding the classroom interaction.

TABLE 1

SUMMARY OF CATEGORIES IN THE MICHIGAN SYSTEM

A. Request for Cognitive Operation

1. Exposition: The speaker requests statements which provide general information or summarize the discussion.

2. Definition and Clarification: The speaker requests statements which (a) tell how the meaning of words are related to one another, or (b) clarify a previous statement.

3. Positions and Hypotheses: The speaker requests statements which include or imply the phrases, "I believe," "I think," "I hold," "I feel," etc., followed by his hypotheses, preferences, evaluations or judgments regarding a given issue.

4. Grounding: The speaker requests reasons supporting a position or hypothesis. Requests for grounding must be clearly linked to a position-statement, hypothesis or proposed definition.

B. Non-Cognitive Operations

5. Non-Cognitive

   5.0 Request for Non-Cognitive Operation
   5.1 Directions and Classroom Maintenance
   5.2 Restatement of Speaker Ideas
   5.3 Acceptance or Encouragement
   5.4 Non-Productive Responses
   5.5 Negative Responses
   5.6 Fragmented Discussion

C. Performance of Cognitive Operation

6. Exposition: The speaker makes statements which provide general information or summarize the discussion.

   6.1 Background
   6.2 Summarizing

7. Definition and Clarification: The speaker makes a statement which (a) tells how the meanings of words are related to one another, or (b) clarifies a previous statement.

7.1 General-Stipulative
7.2 Quality-Value
7.3 Clarification

8. Positions and Hypotheses: The speaker makes statements which include or imply the phrases, "I believe," "I think," "I hold," "I feel," etc., followed by his hypotheses, preferences, evaluations or judgments regarding a given issue.

   8.1 Non-Prescriptive
   8.2 Prescriptive
   8.3 Reassessment

9. Grounding: The speaker gives reasons supporting a position or hypothesis. Grounding statements must be clearly linked to a position-statement, hypothesis or proposed definition.

   9.1 General Knowledge
   9.2 Authority
   9.3 Personal Experience
   9.4 Experience of Others
   9.5 Consequences
   9.6 Position-Taking
   9.7 No Public Grounds

into three coding teams, two coders on a team. These pairs stayed together for five months of coding. The teams used the technique of consensus coding to code transcribed dialogue from each of the 16 classes. Six transcripts were coded twice by two different teams to check for reliability between coding pairs.

In coding the transcripted dialogue the primary unit was an intellectual operation. Every time a transition to a new intellectual operation occurred, either by the same speaker or by a new speaker, a new unit was noted. Whenever there was a shift in speakers a new unit was automatically recorded. It was mentioned earlier that the 26 categories in the Michigan System are applicable to any classroom speaker; no category is reserved for only teacher or student operations. In this study, though, it was important to know whether the teacher or a student performed a given intellectual operation.

Therefore, two notations were used to indicate the speaker; "S" for students and "T" for teachers.

Figure 1 is an example of coded dialogue. The three columns, R,P, and NC on the left of the dialogue are the three major divisions of intellectual operations used in the Michigan Cognitive System; that is, request operations, performance operations, and non-cognitive operations. The column marked "Time" is used to indicate the amount of time (in seconds) devoted to a particular operation. T3, the first entry under R, indicates that the teacher asked that a position be taken or a hypothesis be formed. The eight seconds

Figure 1

R	P	NC	Time	
T3			8	T: What about these draft card burners? She claims they're unpatriotic. Is there anyone who thinks they're not?/
		T51	1	Janet?/
	S81		7	G: I think they're just against the draft and they're not really unpatriotic; they just don't want to be drafted./
		T51	1	T: Faye?/
	S81		3	G: No, I don't think that they're not being patriotic./
S2			3	B: Would you define what you mean by patriotic?/

the teacher took to make the request is entered in the Time column. S81, the first entry under P, indicates that the student took a position or stated a hypothesis which is non-prescriptive. The first notation under the NC column, T51, indicates that the teacher provided "directions and classroom maintenance;" in this instance, he recognized a student. A slash (/) in the body of the transcript indicates that the coder recognized a transition from one unit of discourse to another.

The final codes for a transcript were arrived at by "consensus coding". This procedure is based on the premise that many coding disagreements may be removed if two coders are given opportunity to negotiate their disagreements.

After each coder in a pair analyzed and coded a transcript, the two coders reviewed their disagreements. The coders then tried to resolve each disagreement, if possible, and record a notation which was acceptable to both. In most cases, this type of compromise was reached and resulted in what may be called consensus coding. In those special cases where coders could not agree, each alternated in recording his own preference.

After a transcript was analyzed and consensus codes agreed upon by a coding pair, the sequence of agreed-upon codes and time spent were transferred to computer cards for further analysis.

The Scott Coefficient was used to establish reliability between coder teams. According to one author, the value of the Scott method in estimating reliability rests in the fact that it is "unaffected by low frequencies, can be adapted to percent figures, can be estimated more rapidly in the field, and is more sensitive at higher levels of reliability".[3] The formula

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[3]Ned A. Flanders, "The Problems of Observer Training and Reliability", in Interaction Analysis: Theory, Research and Application, edited by Edmund J. Amidon and John B. Hough (Reading, Massachusetts: Addison-Wesley Publishing Company, 1967), p. 161.

used for calculating the Scott Index is:

$$\text{Scott Index} = \frac{P_o - P_e}{100 - P_e}$$

where P_o is the percent agreement calculated by subtracting the total percent disagreement between the two teams of coders from 100. P_e is found by squaring the average percentage of tallies in each category and summing over all categories.'

In the analysis of the classroom discourse, reliability checks such as the one described above were made at various intervals. In checking for reliability an entire transcript was consensus coded by two separate coding teams. The Scott Reliability Coefficients between coding teams for the selected transcripts are reported in Table 2.

TABLE 2

SCOTT RELIABILITY COEFFICIENTS

CLASS	CODING TEAMS	SCOTT COEFFICIENT
M	A & B	.74
D	A & B	.87
I	A & C	.80
H	A & C	.79
A	B & C	.85
N	B & C	.80

A Scott Coefficient above .80 indicates a high congruence of judgment between the two coding teams in recording identical verbal behavior. In general, then, the reliability between the coding teams was quite high -- particularly when one realizes

that the Scott Coefficient is sensitive to the number of categories used and the above coefficients were calculated using 52 sub-categories.

OPERATIONAL DEFINITION OF VARIABLES

In order to compute the interaction variables, it was first necessary to summarize the coded sequence of interaction data for each class in a meaningful fashion. Two types of interaction matrices were used to summarize the data: an intellectual operation matrix and a times matrix. An intellectual operations matrix shows the distribution and interrelationships among the various operations. The timed matrix shows the distribution of time among the categories. The method of tallying the sequence of coded operations into the two types of matrices in described in Appendix B.

Interaction matrices representing the full-period of classroom dialogue were tabulated for each of the 16 classes in the study. Computer programs tallied an intellectual operations matrix and a timed matrix from class interaction data using all 52 categories and subcategories in the Michigan Cognitive Category System. In addition to producing two interaction matrices based on the 52 categories, the computer programs tabulated matrices based (1) on the 18 main categories and (2) on the 16 cognitive categories. By collapsing subscripts and using only the 18 main categories, it was possible to concentrate on an 18 x 18 category matrix instead of a more cumbersome 52 x 52 category matrix. Tabulating a matrix which ignored the noncognitive categories, T5 and S5, made it possible to focus on the pattern of direct relationships among cognitive operations. Ignoring the non-cognitive categories, T5 and S5, resulted in a 16 x 16 cognitive category matrix containing 256 cells.

Six variables (i/o ratio, p/i ratio, Indirect Teacher Influence, Student Participation, Teacher Requests for Inquiry, and Pr[illegible]es Following Student

Hypotheses) were calculated from the class interaction data. The first four were based on the timed matrices; the fifth was calculated from the intellectual operations matrices; and the sixth was based on a combination of cells in the 16 x 16 cognitive category intellectual operations matrix.

The i/e ratio was defined as the amount of time spent by the teacher and students presenting hypotheses, grounding, definitions, or clarification versus the amount of time spent by the teacher and students providing exposition. The i/e ratio was calculated by summing the class time spent in categories T7+T8+T9+S7+S8+S9 and then dividing by the amount of time spent in categories T6+S6.

The p/i ratio was defined as the proportion of inquiry time spent performing the operations definition, clarification, and grounding. The p/i ratio was computed by summing the time spent in categories T7+T9+S7+S9 and dividing by the time spent in categories T7+T8+T9+S7+S8+S9.

Indirect Teacher Influence was defined as the amount of time the teacher spent indirectly influencing the discourse by asking questions, reinforcing students and using student ideas versus the amount of time the teacher spent directly influencing the discourse by lecturing, offering his own ideas, giving directions or criticizing students. This I/D ratio is similar to the one developed by Flanders and was calculated by dividing the time spent in categories T1+T2+T3+T4+T50+T52+T53 by the time spent in categories T51+T55+T6+T7+T8+T9.

Student Participation was defined as the percentage of class time spent in categories S1 through S9.

Teacher Requests for Inquiry was defined as the total number of times the teacher asked for definitions, clarifications, hypotheses, or grounding divided by the total number of teacher operations. This variable was

computed by dividing the number of operations in categories T2+T3+T4 by the total number of operations in categories T1 through T9.

Probes Following Student Hypotheses was defined as the percentage of student hypotheses followed by requesting or providing definition, clarification, and grounding without any other intervening cognitive operations. This variable was calculated by summing the operations in cells (S8,T2), (S8,T4), (S8,T7), (S8, T9), (S8,S2), (S8,S4), (S8,S7), (S8,S9) of the 16 x 16 cognitive category matrix and dividing by the total number of operations in category S8.

ANALYZING THE CLASS INTERACTION

In this study classes which spent a major portion of their time actually presenting, clarifying, and supporting hypotheses, positions, or opinions were characterized as inquiry-probing. Classes which spent considerable time presenting hypotheses or positions but which did not devote much time to probing their positions were characterized as inquiry-nonprobing. In classes where most of the time was devoted to exposition and very little time was given to either presenting or probing hypotheses, the discussion was categorized as expository. Classifying the discussions was a two-step process. The i/e ratio was first used to classify discussions as expository or inquiry, and then the p/i ratio was used to further categorize inquiry discussions as probing or nonprobing.

The categories used to calculate a class' i/e ratio are shaded in the matrix in Figure 2. The two diagonally shaded areas labeled "e" represent teacher and student exposition, while the shaded areas labeled "i" encompass the inquiry operations performed by the teacher and students. Inquiry operations include such things as presenting hypotheses, evidence, definitions, or clarification. The subscript, t, indicates teacher performance; the subscript, s, indicates student performance. The ratio of the time devoted to operations in the areas labeled e to the time devoted to operations in the areas labeled i indicates whether the class concentrated on exposition or inquiry. An i/e ratio above 1.0 means that the class spent more time presenting hypotheses, definitions, evidence, and clarification than providing exposition, while an i/e ratio below 1.0 means that the class spent more time providing exposition. Thus, classes with i/e ratios below 1.0 were classified as <u>expository</u>, while classes with i/e ratios above 1.0 were classified as <u>inquiry</u>.

The inquiry classes were then divided into two groups; those with p/i ratios below .50 were classified as <u>inquiry-nonprobing</u> while those with p/i ratios of .50 or above were categorized as <u>inquiry-probing</u>. The p/i ratio was defined as the proportion of inquiry time (areas labeled i in Figure 2) spent performing the operations, definition, clarification, and grounding (categories T7,T9,S7,S9). Classes with p/i

FIGURE 2

CATEGORIES USED TO CALCULATE A CLASS i/e RATIO

CATEGORY		TEACHER									STUDENT									TOTAL
		REQUESTS				NC	PERFORMS				REQUESTS				NC	PERFORMS				
		T1	T2	T3	T4	T5	T6	T7	T8	T9	S1	S2	S3	S4	S5	S6	S7	S8	S9	
TEACHER Requests	T1																			
	T2																			
	T3																			
	T4																			
Noncog-nitive	T5																			
Performs	T6																			
	T7																			
	T8																			
	T9																			
STUDENT Requests	S1																			
	S2																			
	S3																			
	S4																			
Noncog-nitive	S5																			
Performs	S6																			
	S7																			
	S8																			
	S9																			
							e_t		i_t							e_s		i_s		

$$\text{i/e Ratio} = \frac{i_t + i_s}{e_t + e_s}$$

ratios of .50 or above concentrated on probing while classes with p/i ratios below .50 devoted more time to generating hypotheses and positions than to probing them.

In Table 3 the 16 classes are listed in their respective groups along with their i/e and p/i ratios. Five class discussions were expository; that is, hypotheses were infrequently

TABLE 3

CLASSIFYING THE DISCUSSIONS

EXPOSITORY		INQUIRY-NONPROBING			INQUIRY-PROBING		
Class	I/E Ratio	Class	I/E Ratio	P/I Ratio	Class	I/E Ratio	P/I Ratio
C	.14	A	2.47	.29	H	2.25	.56
E	.16	B	6.08	.31	K	8.03	.52
F	.12	D	2.95	.32	L	5.14	.51
J	.73	G	1.89	.33	N	5.63	.50
M	.50	I	3.63	.40	O	1.74	.54
Avg	.33	Avg	3.40	.34	Avg	4.08	.56
		Avg i/e ratio = 3.77					

generated or tested. The i/e ratios ranged .14 to .73, with an average of .33; thus, indicating that a large proportion of time was devoted to exposition. In contrast to the expository classes, the eleven inquiry classes had an average i/e ratio of 3.77; thus, the time they spent on inquiry operations was triple the time they devoted to

exposition. An analysis of variance, reported in Table 4 confirmed that the expository classes differed significantly from the inquiry classes on this criterion. The F-ratio was 12.46, significant at the .01 level.

Five of the discussions were characterized as inquiry-nonprobing. In these classes the participants spent most of their time hypothesizing and did not clarify or defend many of their positions. The average p/i ratio for the inquiry-norprobing classes, .34, indicates that only a third of the

TABLE 4

COMPARING GROUPS ON THE CRITERION VARIABLES

ANALYSIS OF VARIANCE	CRITERION VARIABLES	
	INQUIRY DIALOGUE	P/I RATIO
1. Comparing Expository Classes To Inquiry Classes	$F_{1,14} = 12.46^{**}$	
2. Comparing Inquiry-Nonprobing To Inquiry-Probing Classes	$F_{1,9} = .25$	$F_{1,9} = 41.47^{***}$

*** Significant beyond the .001 level
** Significant at .01 level

inquiry time was devoted to probing operations. The five inquiry-probing classes, on the other hand, had an average p/i ratio of .56. These classes emphasized all three components of reflective thought--recognizing a problem, generating hypotheses, and probing hypotheses by testing their defensibility.

Furthermore, a fairly large numerical break occurs between the p/i ratio for the highest inquiry-nonprobing class, .40 for class I, and the p/i ratio for the lowest inquiry-probing class, .50 for class N. The analysis of variance, reported in Table 4, confirmed that the inquiry-probing classes did not differ significantly from the inquiry-nonprobing classes on the first criterion, i/e ratio, but did differ significantly on the second criterion, the p/i ratio.

Having classified the discussions into three main groups, we are now ready to inquire into specific aspects of the interaction in expository, inquiry-nonprobing and inquiry-probing classes. Do teachers in inquiry classes use more indirect influence than teachers in expository discussions? How much impact do teacher questions have on the nature of the discussion? In which classes do students participate most frequently?

(a) Teacher I/D Ratios

It was hypothesized that teachers in inquiry classes would use more indirect influence than teachers in expository classes. An I/D ratio similar to the one developed by Flanders was used to measure whether teachers attempted to influence the discussion directly or indirectly. A high I/D ratio indicates that the teacher concentrated on asking questions and using student ideas, while a low I/D ratio indicates that the teacher concentrated on lecturing, giving directions and stating his own opinions and ideas. It was assumed that in expository discussions the teacher provides a majority of the exposition and only asks questions when he would like students to recall and summarize what has been previously said or fill-in information which he, as the teacher, wishes to develop in class. On the other hand, inquiry sequences depend heavily on indirect teacher influence. The teacher promotes

student inquiry by asking questions which encourage students to present, probe, and test ideas. Although it is theoretically possible for the teacher to depend primarily on direct influence in an inquiry discussion (for example, he could spend the entire period stating and defending his own ideas and opinions), it was assumed that in actual practice direct influence is not the dominant teacher style in inquiry discussions.

In Table 5 it can be seen that teachers in inquiry discussions do, in fact, use more indirect influence than teachers

TABLE 5

TEACHER I/D RATIOS

EXPOSITORY CLASSES		INQUIRY CLASSES			
Class	I/D Ratio	Class	Teacher I/D Ratio	Class	Teacher I/D Ratio
C	.39	A	1.40	K	.63
E	.24	B	.98	L	.74
F	1.11	D	.49	N	1.05
J	.76	G	2.11	O	.46
M	.32	H	1.33	P	2.33
		I	.68		
Mean = .56 S.D. = .36		Mean = 1.11 S.D. = .63			

in expository discussions. The average I/D ratio for the inquiry teachers, 1.11, is almost twice as great as the average I/D ratio for the expository teachers, .56. In examining the individual classes in the table, though, it also is apparent

that the I/D ratios for the individual classes vary tremendously. In the expository classes, the teachers' I/D ratio ranges from .24 to 1.11 while in the inquiry classes the I/D ratio varies from .46 to 2.33. The variance within the inquiry group is clearly greater than the variance between the groups. The large within-group variance is clearly evident in the analysis of variance presented in Table 6. Although the inquiry teachers use twice as much indirect influence as the expository

TABLE 6

ANOVA: COMPARING THE TEACHER I/D RATIOS FOR THE EXPOSITORY AND INQUIRY CLASSES

SOURCE	SUM OF SQS.	DF	MEAN SQUARES	F-RATIO
Between Groups	102.14	1	102.14	3.16(a)
Within Groups	453.18	14	32.37	
Total	555.32	15		

(a) Significant at the .10 level

teachers, the difference between the groups is only significant at the .10 level. Thus, it is not possible to reject the null hypothesis.

How can the large variance in teacher I/D ratios be explained? Why are the I/D ratios for the teachers in expository classes F and J comparatively high and the I/D ratios for the teachers in inquiry classes D and O comparatively low? In examining the discussions in classes F and J, we find that these

two teachers consistently chose not to provide background information, themselves, but instead chose to ask questions which required the students to recall or summarize information they had previously read. In class F the teacher presented ten situations regarding actions of state governments and then asked the students to tell what a state could or could not do. The following excerpt is typical of much of the discussion which took place in this class.

Codes	Dialogue
T1 T51	T: Michigan has decided to levy a tax on all vegetables going out of the state by truck. Is that legal or illegal?/ Janet./
T61	S: Illegal. The book says it is illegal./
T1	T: Why is it illegal?
S61	S: Because the Constitution gives the Federal Government the power to regulate interstate commerce.

Class J discussed the history of immigration and immigration quotas in the United States and the teacher depended heavily on student recitation. For example,

Codes	Dialogue
T62 T1 T51	T: Now a couple of days ago we said that basically there were three reasons why immigrants came to this country. We said three main reasons./ What might those reasons be?/ Carol?/
S61	S: Freedom of religion./
T52 T1	T: Freedom of religion./ What else?/
S61	S: Political and economic freedom.

T51 T1 T51 — T: Let's go through our book and see if we can find some examples./ 1607. What about that one./ Gary?/

S61 — S: "Founding of Virginia by English colonists to fetch treasurers, to enjoy religious freedom, and a happy government."

Turning to the two inquiry classes in question, we find that the reason the teacher in class D had such a low I/D ratio was that he read case studies to the class. In this class, the teacher first read four actual situations where two individuals were planning to get married, and then asked the students whether they thought the marriage would work. The case studies were very extensive and a great portion of the teacher's participation consisted of reading them. Since reading is considered direct influence, teacher D had a low I/D ratio.

Class O is interesting. In this discussion the teacher did two things--he frequently gave his own opinions and ideas <u>and</u> he spent more time than any other teacher in the study recaping the status of the discussion. Since both these operations are categorized as direct influence, he also had a low I/D ratio.

It does not appear from the data that one can conclude with any great assurance that indirect teacher influence leads consistently to inquiry discussions. Although teachers in the inquiry classes tended to use somewhat more indirect influence than teachers in expository classes, their styles of influence varied tremendously. Also, a teacher may ask many questions, but if the questions call for student exposition, then the

discussion is likely to be expository no matter how much indirect influence the teacher uses.

(b) Teacher Questions

A number of educators have emphasized the role of teacher questions in determining the cognitive nature of classroom discourse. For example, Sanders argues that "a certain kind of question leads to a certain kind of thinking,"[4] while Fenton states that "the types of questions a teacher asks as he leads a student to look at the logical implications of his position holds the key to success."[5] Gallagher and Aschner, in their analysis of classroom interaction, found that the number of divergent questions asked by teachers was directly related to the amount of divergent thinking exhibited in the classroom by students.[6] In a similar vein, two other educators studying the impact of teacher verbal behavior on the thinking of students in the classroom, also found that the type of teacher questions had an enormous influence on the cognitive nature of the class discussion.[7]

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[4]Norris M. Sanders, Classroom Questions: What Kinds? (New York: Harper and Row, 1966), pg. 8.

[5]Edwin Fenton, The New Social Studies (New York: Holt, Rinehart and Winston, 1967), pg. 44.

[6]James J. Gallagher and Mary Jane Aschner, "A Preliminary Report on Analyses of Classroom Interaction," Merrill-Palmer Quarterly of Behavior and Development, IX (July 1963), 186.

[7]Hilda Taba and Freeman F. Elzey, "Teaching Strategies and Thought Processes," Teachers College Record, LV (March 1964) 524-534.

If teachers' questions do have a major impact on the character of classroom discourse, then one would expect teachers in the inquiry classes in this study to ask significantly more inquiry questions than teachers in the expository classes. Teacher requests for inquiry may be seen graphically by referring to the shaded areas in the matrix in Figure 3. Area A represents teacher questions which call for definition, clarification, hypotheses, or grounding. Area B encompasses all of the teacher operations. The total number of operations in Area A over the total number of operations in Area B represents the percentage of teacher operations devoted to inquiry questions.

The proportion of inquiry questions asked by each of the 16 teachers in this study is summarized in Table 7 . A striking

TABLE 7

TEACHER INQUIRY QUESTIONS

EXPOSITORY CLASSES		INQUIRY CLASSES			
Class	Inquiry Questions	Class	Inquiry Questions	Class	Inquiry Questions
C	17%	A	27%	K	32
E	7	B	31	L	30
F	5	D	26	N	29
J	12	G	28	O	23
M	13	H	33	P	30
		I	24		
Mean = 10.8% S.D. = 4.8		Mean = 28.5% S.D. = 3.2			

characteristic of the data in this table is that every teacher in the inquiry group asked more inquiry questions than any one

FIGURE 3

TEACHER REQUESTS FOR INQUIRY

CATEGORY		TEACHER									STUDENT									TOTAL
		REQUESTS				NC	PERFORMS				REQUESTS				NC	PERFORMS				
		T1	T2	T3	T4	T5	T6	T7	T8	T9	S1	S2	S3	S4	S5	S6	S7	S8	S9	
TEACHER Requests	T1																			
	T2																			
	T3																			
	T4																			
Noncog-nitive Performs	T5																			
	T6			A																
	T7																			
	T8																			
	T9																			
STUDENT Requests	S1																			
	S2																			
	S3																			
	S4																			
Noncog-nitive Performs	S5																			
	S6																			
	S7																			
	S8																			
	S9																			
TOT CATEGORY																				
TOT SPEAKER						B														

$$\text{Teacher Requests for Inquiry} = \frac{\text{Area A}}{\text{Area B}} \text{ (operations)}$$

of the expository teachers. Not a single expository teacher devoted more than 17 percent of his influence to inquiry questions while no inquiry teacher apportioned less than 24 percent of his operations to inquiry questions. In the expository classes the percent of inquiry requests ranges from 5 to 17 while in the inquiry classes the range goes from 23 to 33. The average for the inquiry classes is almost triple the average for the expository classes. The dramatic difference between the two groups is further highlighted by the analysis of variance presented in Table 8 The F-ratio is 76.7 which is significant considerably beyond the .001 level.

TABLE 8

ANOVA: COMPARING TEACHER INQUIRY QUESTIONS FOR EXPOSITORY AND INQUIRY CLASSES

SOURCE	SUM OF SQS.	DF	MEAN SQUARES	F-RATIO
Between Groups	1071.41	1	1071.41	76.7***
Within Groups	195.53	14	13.97	
Total	1266.94	15		

*** Significant beyond the .001 level

It can be safely concluded from the data that teacher inquiry questions are instrumental in promoting and sustaining inquiry discourse. The teacher sets the stage by the type of question he asks, and the students perform accordingly. A teacher who desires to promote student inquiry into social issues would do well to evaluate the questions he poses during class discussions.

(c) Student Participation

Go into a classroom and what do you hear? According to Flanders, "if someone is talking, the chances are that it will be the teacher more than 70 percent of the time."[8] Of course, this figure varies from class to class, but it does help one evaluate the amount of student participation which occurred in the classes in this study. Examining Table 9 we find that the average amount of student participation in the

TABLE 9

STUDENT PARTICIPATION

EXPOSITORY		INQUIRY-NONPROBING		INQUIRY-PROBING	
Class	Student Participation	Class	Student Participation	Class	Participation
C	07%	A	60%	H	64%
E	65	B	75	K	60
F	15	D	48	L	32
J	48	G	74	N	61
M	16	I	70	O	28
				P	36
Mean = 30.2 S.D. = 25.0		Mean = 65.4 S.D. = 11.4		Mean = 46.8 S.D. = 16.5	
		Mean = 55.3 S.D. = 16.8			

[8]Ned A. Flanders, Teacher Influence, Pupil Attitudes, and Achievement (Washington, D.C.: U.S. Department of Health, Education, and Welfare, Office of Education, 1965), p. 1.

expository classes was very close to the figure quoted by Flanders--the students talked 30 percent of the time. The student participation in these classes, though, varied tremendously. For example, in class C the teacher completely dominated the discourse. He lectured on Malthus' ideas about the population crisis and only rarely interrupted his lecture to question students on various points. The teachers in classes E and M dominated the discussion in a similar fashion. On the other hand, the students in class E participated 65 percent of the time. In this class the students read and summarized passages from the text--not the most challenging intellectual activity, but the students did participate.

Students in the inquiry classes were more deeply involved in the class discussion than students in the expository classes. In these eleven classes the students talked an average of 55 percent of the time, an even balance between teacher and students which would please most educators. Although the amount of student participation varied from class to class, the variance in the inquiry group was not as great as that in the expository group. In only one inquiry class, O, did the teacher talk more than 70 percent of the time, and it was mentioned earlier that this teacher's participation consisted primarily of presenting four case studies to the class for their reaction. The analysis of variance in Table 10 indicates that the inquiry discussions included significantly more student participation than the expository discussions.

TABLE 10

ANALYSES OF VARIANCE: STUDENT PARTICIPATION

ANALYSIS	SOURCE	SUM OF SQS.	DF	MEAN SQUARES	F-RATIO
Expository Classes Compared To Inquiry Classes	Between Groups	2160.96	1	2160.96	5.69*
	Within Groups	5318.98	14	379.93	
	Total	7479.94	15		
Inquiry-Nonprobing Classes Compared To Inquiry-Probing Classes	Between Groups	940.15	1	940.15	4.50 (a)
	Within Groups	1880.03	9	208.89	
	Total	2820.18	10		

(a) Significant at .01 level
* Significant at .05 level

An interesting aspect of the data presented in Table 9 is the fact that students in the inquiry-nonprobing discussions talked more than students in the inquiry-probing classes. Although the difference is only significant at the .10 level (Table 10), it does provide some food for thought. A number of the inquiry-nonprobing discussions were characterized by the taping teams as "rambling" or "bull-sessions," while the inquiry-probing discussions generally evidenced a clear focus. Perhaps it was to discourage rambling and encourage students to probe and test their hypotheses and positions that teachers in the probing classes intervened more frequently in the discussion than teachers in the nonprobing classes. The students in the probing classes with relatively high student participation,

classes H, K, and N, may have spontaneously grounded their positions, while the students in the three probing classes with relatively low student participation may have depended upon the teacher to get them to probe positions. This possibility will be explored further in the following section.

(d) Cognitive Interaction Following Student Hypotheses

What happens after a student presents a hypothesis or states a position? It was expected in this study that the answer to this question should differ in inquiry-nonprobing and inquiry-probing classes.[9]

We know, by definition, that the participants in the inquiry-probing classes spend significantly more time than the teacher and students in nonprobing classes giving reasons for their positions and clarifying and defining concepts and terms. But exactly when and how does this probing occur? It was felt that by looking at the cognitive interaction following a student hypothesis we could begin to answer this question.

Tables 11 and 12 offer information concerning the cognitive operations that occur after a student presents a hypothesis or position, S8. The classes are listed at the left of the table and the total number of student hypotheses in each class is indicated in the far right column. The operations

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[9] The expository classes are not included in this discussion; in four of these classes so few hypotheses were generated that any analysis would be meaningless.

TABLE 11

INQUIRY-NONPROBING CLASSES
COGNITIVE INTERACTION FOLLOWING STUDENT HYPOTHESES*

CLASS	NUMBER (AND %) OF RESPONSES IN EACH CATEGORY																TOTAL Student Hypothes.
	T1	T2	T3	T4	T6	T7	T8	T9	S1	S2	S3	S4	S6	S7	S8	S9	
A	4 (5)	7 (9)	17 (21)	3 (4)	1 (1)	-	5 (6)	-	-	2 (3)	-	-	6 (7)	1 (1)	22 (27)	13 (16)	81 (100)
B	1 (1)	6 (4)	15 (9)	5 (3)	4 (2)	2 (1)	5 (3)	-	-	2 (1)	7 (4)	-	4 (2)	-	84 (51)	30 (18)	165 (100)
D	2 (2)	5 (5)	20 (22)	3 (3)	8 (9)	-	8 (9)	-	-	-	-	-	1 (1)	1 (1)	21 (23)	23 (25)	92 (100)
G	1 (1)	-	11 (15)	-	3 (4)	-	-	-	-	2 (3)	6 (8)	-	6 (8)	-	22 (30)	23 (31)	74 (100)
I	1 (1)	4 (4)	7 (6)	1 (1)	8 (7)	1 (1)	4 (4)	1 (1)	-	2 (2)	10 (9)	5 (4)	1 (1)	3 (3)	32 (28)	33 (29)	113 (100)
Avg. Per-Cent	(2)	(4)	(14)	(2)	(5)	(1)	(4)	(0)	(0)	(2)	(4)	(1)	(4)	(1)	(32)	(24)	(100)

*Taken from a 16 by 16 cognitive category matrix

TABLE 12

INQUIRY-PROBING CLASSES
COGNITIVE INTERACTION FOLLOWING STUDENT HYPOTHESES*

CLASS	NUMBER (AND %) OF RESPONSES IN EACH CATEGORY																TOTAL Student Hypothes
	T1	T2	T3	T4	T6	T7	T8	T9	S1	S2	S3	S4	S6	S7	S8	S9	
H	1 (1)	3 (4)	14 (17)	4 (5)	4 (5)	-	3 (4)	-	2 (2)	-	2 (2)	-	-	-	18 (22)	31 (38)	82 (100)
K	-	1 (1)	11 (14)	1 (1)	2 (3)	-	-	-	-	-	-	-	-	-	13 (16)	51 (65)	79 (100)
L	1 (1)	9 (13)	14 (21)	6 (9)	3 (5)	-	3 (5)	-	-	-	-	-	3 (5)	-	7 (10)	21 (31)	67 (100)
N	-	1 (2)	11 (19)	-	3 (5)	-	1 (2)	-	-	-	-	-	1 (2)	-	8 (14)	32 (56)	57 (100)
O	-	1 (3)	9 (26)	2 (6)	4 (11)	5 (14)	2 (6)	1 (3)	-	-	-	-	-	-	-	11 (31)	35 (100)
P	10 (21)	4 (8)	11 (23)	8 (17)	1 (2)	1 (2)	2 (4)	-	-	2 (4)	-	-	-	-	5 (10)	4 (8)	48 (100)
Avg. Per-Cent	(4)	(5)	(20)	(6)	(5)	(3)	(4)	(1)	(0)	(1)	(0)	(0)	(1)	(0)	(12)	(38)	(100)

*Taken from a 16 by 16 Cognitive Category Matrix

immediately following the hypotheses are given in two sets of figures. The first number in each cell represents the actual number of times a student hypothesis was followed by the operation in that category, while the number in the parentheses is the percent of all cognitive operations following hypotheses which were in that category. The average distribution of responses for all the inquiry-nonprobing classes is at the bottom of Table 11, while the average distribution for the inquiry-probing classes is found at the bottom of Table 12.

Looking at the average distribution for the inquiry-nonprobing classes in Table 11, we find that the cognitive operation which most frequently followed a student hypothesis was another student hypothesis (S8), an operation which accounts for 32 percent of the distribution. This indicates that the same student is stating an uninterrupted series of hypotheses or another student is reacting to the first student by presenting his own hypothesis. In 18 percent of the cases the teacher and students asked for additional hypotheses (T3 and S3), while 4 percent of the time the teacher stated a hypothesis himself (T8). Thus, in over half the cases, teachers and students in inquiry-nonprobing classes reacted to a student hypothesis by giving or requesting additional hypotheses.

What about giving or asking for probing operations such as definition, clarification and grounding? In these classes 24 percent of the entries consisted of spontaneous grounding. That is, the students moved naturally from hypothesis to grounding

without intervention on the part of the teacher or other students. If the student did not spontaneously defend his position, though, there was only a 3 percent chance that another member of the class would ask for grounding (T4 and S4). Six percent of the hypotheses were followed by teacher or student requests for definition or clarification (T2 and S2), while in 2 percent of the cases the students or teacher actually clarified or defined positions, concepts or terms (T7 and S7). Combining all the probing operations (T2, T4, T7, T9, S2, S4, S7, S9), we find that approximately one-third of the student hypotheses were followed by the class participants providing or requesting probing.

The reverse pattern exists in the inquiry-probing classes. In these discussions 55 percent of the student hypotheses were followed by individuals giving or asking for probing operations such as definition, clarification and grounding, while in 36 percent of the cases the teacher and students responded to a student hypothesis by offering or requesting additional hypotheses. The cognitive operation which most frequently follows student hypotheses was spontaneous grounding. Evidently, the members of these classes have made considerable progress toward internalizing a central concept in reflective inquiry; namely, defending or clarifying ideas and opinions.

In the previous section it was suggested that those probing discussions which evidenced relatively high student participation (classes H, K and N) would also contain considerable

student spontaneous grounding, while those probing classes with relatively low student participation would be characterized by more frequent teacher requests for probing (classes L, O, and P). Looking again at Table 12 we find that, in fact, those classes with relatively high student participation did exhibit higher levels of student spontaneous grounding (38, 65, and 56 percent, respectively) than the other three probing classes (31, 31 and 8 percent). In two of these latter classes (L and P) teacher requests for probing accounted for a much larger proportion (22 and 25 percent) of the operations following student hypotheses. In classes L and P the students evidently depended on teacher questions to evoke further probing of positions.

The discussion in this section would seem to indicate that if teachers are to encourage and sustain reflective inquiry they should be particularly aware of what happens after a student presents a hypothesis. If the student does not spontaneously support his ideas or if other students do not request that he do so, then the teacher should ask the student to support his position. Hopefully, after enough encouragement, the students will begin to naturally probe their own hypotheses and challenge other students to do likewise.

SUMMARY

It was possible in this study to identify rather di[illegible]t discussion styles centering on social issues and to categ[illegible] discussions as expository, inquiry-nonprobing and inqui[illegible] ing. Expository classes concentrated on sharing informat[illegible]

about the social issues in question. Inquiry-nonprobing classes devoted most of their time to giving opinions, hypotheses, and positions on issues but did not devote much time to grounding, clarifying, or testing their ideas. The members of inquiry-probing classes stressed both giving and probing their ideas and hypotheses.

In examining specific aspects of the class interaction in these three types of discussions, it was found that the level of student participation was greater in inquiry classes than in expository classes. Although teachers tended to ask more questions and use student ideas more frequently in inquiry discussions, the difference between the expository group and inquiry groups was only significant at the .10 level. The main aspect of teacher influence which distinguished expository teachers from inquiry teachers was the type of questions the teachers asked during the discussion. Inquiry teachers asked students to present hypotheses, define or clarify their terms and ideas, and ground their positions while expository teachers tended to ask questions which required the students to recall and summarize previously learned information.

Students in inquiry-nonprobing discussions participated more in the class dialogue than students in inquiry-probing classes, although the difference between the groups was only significant at the .10 level. When these two groups of classes were compared to see what happens after a student presents a hypothesis, it was found that in inquiry-probing classes student

hypotheses were more frequently followed by members of the class giving or asking for probing operations such as definition, clarification and grounding, while in inquiry-nonprobing classes, student hypotheses were more frequently followed by the teacher or students giving or requesting additional hypotheses.

When the inquiry-probing classes were examined more closely, it was discovered that the six classes fell into two distinct groups. In three of the classes the students spontaneously grounded their positions, while in the other three classes the students probed and tested their ideas primarily as a result of teacher questions. In the three probing classes with relatively high spontaneous grounding, the students had evidently internalized the value of public defensibility of positions, and it was not necessary for the teacher to intervene as frequently in the discussion. Thus, the amount of student participation in these classes was as great as the amount of student participation in the inquiry-nonprobing classes. In the three probing classes with relatively low student spontaneous grounding, the teacher intervened more frequently in the discussion to ask students to probe their ideas and the total student participation was much lower.

It appears from the findings presented in this paper that if teachers are interested in promoting the reflective examination of social issues by their students, they should (1) ask questions and use student ideas, rather than lecture, (2) concentrate on questions which encourage students to present and support their ideas, and (3) be very aware of what happens

after a student presents a position; if he does not spontaneously defend his ideas or if other students do not challenge him to do so, then the teacher should ask for further clarification, evidence, or grounding.